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Using Future Authoring to Improve Student Outcomes

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Executive Summary

Overview and Motivation

Improving student outcomes is a primary goal of all postsecondary institutions. This report includes the first set of results for a research project that aims to understand the effectiveness of an intervention designed to improve postsecondary student success.

Student orientation and transition programs constitute an important part of Mohawk College's Student Success Plan. The college endeavours to facilitate the development of an individualized "Future Ready Plan" for students to ensure they are prepared for their college experience by organizing goal-setting workshops during orientation and initial transition activities. Recent evidence suggests that an online, guided, writing-intensive approach to goal setting and self-authorship may have significant effects on student outcomes, such as retention and academic performance (Morisan et al., 2010; Schippers, Scheepers & Peterson, 2015).

This study aims to contribute to the literature by testing this approach to goal setting, in particular the Future Authoring tool studied in Shippers et al. (2015) in orientation and transition programs in an Ontario community college context. Mohawk College currently does not use a writing-intensive approach in goal-setting activities in its student orientation and transition programming, thus providing a natural setting to examine the effects of the Future Authoring program on student outcomes.

Future Authoring

The Future Authoring program is an online application combining the methods of narrative therapy and industrial/organizational goal setting, designed to improve student performance using an effective, research-based, fully-scalable writing program. The first stage of the program asks students to write briefly about important domains of their life and what their lives could look like three to five years in the future if they take care of themselves properly. It also asks participants to write about undesired future outcomes that might occur if bad habits and undesirable behaviours were allowed to predominate their lives.

The second stage of the program involves the analysis and organization of the positive vision developed in the first stage and the formulation of a detailed plan for implementation and self-monitoring. Participants are required to title and rank-order their goals, to justify each of them from a personal, familial and social perspective, to consider potential obstacles and how they might be overcome, and to formulate a personal progress monitoring process.

Experimental Design

Student orientation and transition programs at Mohawk, such as the Start Smart summer orientation program, are promoted and made available to all applicants who have accepted their offer of admission and plan to attend Mohawk College in the fall semester. Students who participated in the Start Smart program were recruited into this study as part of that program. There were no changes to the usual communication

and marketing approach used by the college. All students began Start Smart in a large lecture theatre for a welcome and orientation session. As they signed-in, they were each given a personal schedule for the day, which randomly placed them into two equally-sized streams.

The session immediately after the welcome session was called "Building Your Future Ready Plan," which all students attended. However, one group was directed into labs for the Future Authoring workshop, while the other half was directed into other classrooms for the typical goal-setting workshop Mohawk offers every summer. Both groups received the same information pamphlets, but the activities they engaged in differed.

Evaluation of Intervention Effects

The decision to leave college early, which is a binary variable, is modelled using a logistic regression model and first-term GPAs are modelled using a linear regression model. The models for retention and first-term GPA take into account differences in student characteristics such as gender, age, credential, school, high school average and pre-admission assessment test scores.

This report presents the estimates for intention-to-treat effects rather than the average treatment effect of the intervention. More precisely, the treatment group not only includes students who completed both sections of the Future Authoring program, but also those who completed only a part of the program. Therefore, we are essentially reporting the effects of being assigned to the treatment.

Main Empirical Findings

The main empirical findings in this report are as follows:

- Overall, the distributions of student characteristics look very similar between the treatment and control groups; however, there are statistically significant differences in the credential and school distributions.
- The assignment to the Future Authoring program had a decreasing effect on the overall leaving rate (14.8% for control group) of participants by 3.3 to 4.3 percentage points.
- The estimated effects tend to be larger in magnitude for students who typically have higher leaving rates (e.g. males vs. females, certificate vs. advanced diploma, Interdisciplinary Studies vs. Business, a grade of B and below vs. A minus). For example, males in the treatment group had leaving rates 5.9 to 8.0 percentage points lower than those in the control group (17.1% leaving rate), while the difference in leaving rates between the experimental groups for females is small and statistically insignificant.
- The point estimates for GPAs are positive; however, these are generally very small in magnitude and statistically not different from zero.

Conclusions and Directions for Future Research

This report provides an analysis of the effects of Future Authoring on student retention and first-term GPAs at Mohawk College. The findings show that the intention-to-treat effects of the Future Authoring program are 3.3 to 4.3 percentage points for leaving rates, and that the effects on first-term GPAs are very small in magnitude and statistically insignificant. Furthermore, while the effect on leaving rates is around 8 percentage points for males, it is very small in magnitude and statistically insignificant for females.

A limitation of this study is that once a student is assigned to the treatment group, the completion of the program may not be fully random due to self-selection. Future work will try to control for this self-selection problem by using *instrumental* variables. Another way to minimize the issue of self-selection could be to redesign the experiment and/or its administration without compromising the integrity of the Future Authoring exercise to remove non-compliance.

The goal of future research will be to track the Fall 2015 cohort's retention and first-term GPA outcomes through to March 2019, in order to examine the intervention's effects on different retention measures (e.g., from semester one to three, two-year and three-year retention) and GPAs based on longer periods of study (e.g., first-year GPA, GPA at graduation). This will help us understand whether and to what degree the Future Authoring program has long-term effects on student outcomes. Another element of future work will be to relate the word count of the student's Future Authoring submission, which can be thought of as a proxy for student effort, to the student's outcomes.

Implications for practice include consideration for scaling the program to a broader audience and maximizing the potential improvements to retention. As an online program, there is the potential to provide this as an intervention for all students through the orientation program, as a resource for advisers and counsellors, or perhaps as a key class assignment in specific first-semester courses across programs. A good place to start may be by targeting students who seem most likely to benefit from the intervention, such as those in male-dominated programs including business, technology or the trades. While more research is necessary to replicate and validate the significance of the effects on men and those students traditionally most at-risk of leaving college early, the potential for an intervention making such a difference is important, especially since Mohawk has observed that men typically have lower retention rates than women.

1. Introduction

Improving student success is of great interest to all postsecondary institutions. Two of the most common student success measures are student retention and postsecondary academic performance. A wide variety of programs and services — such as offering more intensive advising services, student coaching and text-message reminders for financial-aid applications, among many others — could be implemented to improve student outcomes. This report examines the effect on student retention and college grades of participation in a writing workshop called Future Authoring implemented at Mohawk College.

The Future Authoring program is an online application combining the methods of narrative therapy and industrial/organizational goal setting. It is designed to improve student performance using an effective, research-based, fully-scalable writing program. This project uses the narrative therapy approach in collaboration with Professor Jordan B. Peterson of the University of Toronto's Department of Psychology. Professor Peterson is recognized internationally as one of the leading clinical researchers employing the narrative therapy/goal-setting approach to improve student outcomes.

In collaboration with Professor Peterson, Mohawk administered the Future Authoring program in Summer 2015 to a randomly selected group of students from the Fall 2015 entering student population who participated in the Start Smart summer orientation program. In this project, we aim to understand whether and to what degree the Future Authoring intervention affects student retention and first-term GPAs.

The report first tests if the random assignment of students to control and treatment groups was successful. Second, we present a descriptive analysis of retention and first-term GPAs for both control and treatment groups to give a first set of estimates for the effect of being assigned to the intervention. This preliminary analysis is then followed by a detailed analysis of the effects by modeling both retention and first-term GPAs using logistic and linear regression models, respectively, and accounting for student characteristics.

This work stems from a unique partnership between Mohawk College and the Education Policy Research Initiative (EPRI) at the University of Ottawa. With a foundation of sound research and data-sharing agreements, this partnership leverages the interests and strengths of each organization to generate practical research questions, novel primary research and an efficient application of lessons learned into practice.

2. Literature Review

Improving access to postsecondary education has long been a key goal for colleges and universities alike. More recently, the gaze of administrators and practitioners has expanded from initial access to a concept of continual *student success* (Wiggers & Arnold, 2011). Improving student success is heralded as the primary goal of all postsecondary institutions (Reason, 2009; Wiggers & Arnold, 2011). However, it is admittedly an incredibly complex and interconnected endeavour, which precludes the possibility of identifying a single best practice that is most effective at improving student achievement, retention and outcomes. While there is arguably no "silver bullet" for improving student success (Kuh, 2005; Wiggers & Arnold, 2011), there are many "high impact practices" that have been cited as very effective (Kuh, 2008; Center for Community

College Student Engagement [CCCSE], 2014). One approach to improving students' academic achievement was tested by Castleman and Page (2014), who found that sending text messages to students reminding them of the tasks required to apply to colleges increased enrolment into a two-year college by 3 percentage points. Often cited are first-year student orientation and transition programs, writing intensive courses, and interventions that involve student advising and goal setting. Such approaches to supporting student success put student development theories such as self-authorship into practice. Recent research that blends traditional student development work with behavioural psychology has emerged that suggests that an online, guided, writing-intensive approach to goal setting and self-authorship may have profound effects on student success outcomes, including retention and academic performance. A recent pilot study by Oreopoulos et al. (2016) at the University of Toronto Mississauga combines a goal-setting exercise with a texting intervention to improve student performance. Preliminary findings show higher grades (half a letter grade) were achieved by the treatment group. Using this approach to goal setting in orientation and transition programs has not been tested or written about in community college literature. This study aims to fill that gap.

As one of the first points of contact students will have with their institutions, first-year transition and orientation programs are espoused as an important institutional practice, especially within community colleges. In 2014, for example, the Center for Community College Student Engagement (CCCSE) noted that orientation programs were one of 13 high-impact practices that improve student outcomes (CCCSE, 2014). With an emphasis squarely on retention, Rendon's (1995) study of first-generation students in community colleges also identified a successful college transition process, aided by initial orientation, as one of two critical factors in students' decisions to remain enrolled. As Tinto (1993) explains, if students (especially those at risk) are supported early in their academic careers, their chances of reaching their educational goals increase. Consequently, "orientation and transition is a critical component of student success" (Poirier, 2015, p. 211), which has demonstrated a positive impact on first-year grade point average, persistence to the second year of study and graduation rates (Busby, Gammel, & Jeffcoat, 2002; Erikson, 1998; Fabich, 2004), in addition to critical pieces of the student experience including academic and social integration (Nadler, Miller & Dyer, 2004; Robinson, Burns, & Gaw, 1996), greater involvement in the campus community during the first year (Gentry, Kuhnert, Johnson, & Cox, 2006), and positive feelings about college (Nadler et al., 2004; Stripling & Hinck, 1993). As "a collaborative institutional effort to enhance student success by assisting students and their families in the transition to the new college environment" (Upcraft, Gardner, & Barefoot, 2005, p. 393), orientation programs have thus become a common practice used by most colleges and universities in Canada, including Mohawk College.

Given the complexity of student success at the postsecondary level, the curricula and structure of college orientation programs vary with different institutional contexts and student demographics. In Ontario, for instance, Poirier (2015) found that between 2005 and 2010, three large, urban colleges gained a more holistic understanding of first-year orientation as a process, rather than merely as an event, thus bringing a greater breadth and depth to these institutions' definitions of successful transition programs. With such an expanded view, key questions relating to orientation programming emerge, concerning the kinds of processes, supports, activities, tools and foci a successful transition program could — and should — utilize.

In an interesting intersection between behavioural psychology and student development theory, emerging discourse recommends that goal setting and self-authorship are likely significant pieces of this student-success puzzle. For instance, Creamer, Baxter Magolda and Yue (2010) note that the concept of *self-authorship* "is required to achieve many of the most critical outcomes of higher education" (p. 2). As a relatively new developmental view on identity formation championed by Baxter Magolda (1992, 2001 & 2009), self-authoring focuses on individuals' development of an internally authentic, consistent identity, which guides their view of the world — and the way they make decisions within it. At its intersection with student development theory, self-authorship is characterized by a shift from depending upon authority, to relying upon an intrinsic understanding of one's self in order to make decisions (Schulenberg, 2013, p. 1). In relation to college students in particular, many first-year students have not had the opportunity to develop this internally consistent identity and are therefore unable to set or achieve realistic, meaningful goals. Pizzolato (2003) suggests that college practitioners can create the conditions for students to realize a *provocative moment*, which spurs this self-authoring process. These insights prove useful for college administrators designing and delivering orientation programs, who glean the importance of embedding goal-setting activities into transition programs to help students take responsibility and gain autonomy over their own learning and educational careers (Cardone, Stoll Turton, Olson, & Baxter Magolda, 2013). At Mohawk College, for instance, goal-setting activities that engage students in personal reflection and academic planning have long been a central component of the Start Smart summer orientation program.

Despite the importance of goal setting, meaningfully engaging first-semester college students in these activities can prove challenging — especially within the context of an orientation program. Championed by Pennebaker and Beall (1986), an emerging body of research indicates that individuals who write thoughtfully about their current and future lives substantially improve their career, academic performance, and both mental and physical health. For example, a meta-analysis of over 20,000 workers indicated that writing about personal goals improved workplace productivity by more than 10% (Orlitsky, Schmidt & Bynes, 2003). This modern body of research on written narratives provides a theoretical foundation for the use of written reflections to help students set, realize and achieve goals at the postsecondary level. For instance, Morisano, Hirsh, Peterson, Pihl and Shore (2010) identified that administering detailed, explicit and written goal-setting interventions to university students on academic probation markedly increased their grade point average and led to higher proportions of these students staying enrolled full-time at the university. A recent large-scale study by Schippers, Scheepers and Peterson (2015) furthered the success of using written goal-setting activities with postsecondary students by administering a short, written goal-setting intervention to undergraduate students, which nearly erased the gender and ethnic-minority achievement gap over the span of two years for 700 students. Mohawk College currently does not use a writing-intensive approach in goal-setting activities as part of Start Smart or any other orientation or transition program, thus laying a strong foundation to build on Schippers et al.'s success with the Future Authoring tool.

3. The Future Authoring Program Implemented at Mohawk

The researchers viewed an in-class application of the Future Authoring program as the preferred approach for a scaled-up delivery; however, such an approach was not feasible for this pilot study. Instead, the researchers utilized a program that could quickly and easily modify its curriculum to test the Future

Authoring intervention, such as Mohawk College's Start Smart first-year orientation program. As a key college transition program for new students, Start Smart typically attracts around 1,000 students each summer prior to the start of the fall semester. Integrating the Future Authoring activity into the curriculum of Start Smart thus ensured a high take-up rate and a cross-sectional analysis of students of varying attributes and abilities. It also represented a test that could provide insight into the initial preferred approach.

Start Smart is a full-day orientation program at Mohawk College, which provides incoming students with resources and information that promote their success as they begin their postsecondary careers. Throughout the summer there are three separate offerings of the program — one in late June, one in late July and one in early September. All students who participated in the Start Smart program were provided with the opportunity to participate in a goal-setting workshop called "Building Your Future Ready Plan" immediately after the large-group morning welcome session. Upon arrival, all students engaged in a registration process where they signed in, confirmed their student information, and were provided with their resource package for the day. In addition, all participants were given a personalized schedule, which randomly placed them into two equally-sized streams; one half was directed into labs for the Future Authoring writing exercise, while the other half was directed into other classrooms for Mohawk's typical goal-setting workshop. Both groups received the same information pamphlets, but their activities differed. For instance, while the Future Authoring group completed the independent, online writing activity, the control group engaged in small-group activities and individual planning exercises related to goal setting and college success. In total, 25 student-affairs staff members were trained in delivering these sessions (including the informed consent process), and 40 student leaders helped to facilitate the registration process.

The online Future Authoring program delivered to the test group consists of two main stages. Stage I involves writing a positive personal vision and a negative counter-vision. For the positive vision, participants were asked to consider and write briefly about important domains of their life — such as career, family, intimate relationships, health and personal pursuits — as part of an initial warm-up exercise. They then wrote for 15 or 20 minutes, without undue concern for grammatical niceties, about what their lives could look like three to five years in the future if they took care of themselves properly. For the negative counter-vision, participants were asked to spend the same amount of time writing about what undesired future consequences might occur if bad habits and undesirable behaviours were allowed to predominate in their lives. The combination of creating a vision and counter-vision provides participants with a clearly defined approach to goal setting and the avoidance of negative outcomes, thus increasing their motivation and decreasing stressful uncertainty.

Stage II of the program involves the analysis and organization of the positive vision developed in Stage I and the formulation of a detailed plan for implementation and self-monitoring. Participants are required, among other things, to title and rank-order their goals, to justify each of them from a personal, familial and social perspective, to consider potential obstacles and how they might be overcome, and to formulate a personal progress monitoring process.

The process requires a substantial amount of thinking and writing on the part of the participants, but can be implemented effectively with the provision of very little contextual information. Participants merely need to be provided with a username and password. They can access the program on their own time. After watching a brief, introductory video that provides an overview of the process, or by being introduced to the Future Authoring program by trained Mohawk staff, they can complete the exercise wherever and whenever they have access to a computer, and can work through it in several sessions for up to 30 days after registration.

4. Data, Experimental Design and Evaluation of Effects

This section describes the data used in this report, the experimental design of the study and the methodology used to estimate the effects of the Future Authoring intervention. We begin by describing the data.

4.1 Data Collection and Transfer

For this project, thorough and closely monitored operations allowed for effective data capture, transfer and analysis. As per the process outlined in the Research Ethics Board (REB) protocol approved by both the University of Ottawa and Mohawk College, two data transfers occurred for the Future Authoring project. First, the students who participated in the Start Smart program completed the Future Authoring exercise through the use of a website. In order to complete the Future Authoring activity, all students were provided with a unique log-in and password. This registration data — along with participants' written answers — were securely transmitted to Mohawk College from the Future Authoring database.

Researchers at Mohawk College provided students in both the Future Authoring group and the control group with a personalized label that included their full name and student number upon registration at the Start Smart orientation session. During the intervention, students placed these labels on their signed Informed Consent forms in order to allow for an accurate capture of the participants' student data. Upon receipt of the students' Future Authoring data in October 2015, Mohawk College then merged the students' Future Authoring dataset to their institutional student number, removing the student's log-in identification. This dataset was then sent to Institutional Research at Mohawk, which consolidated the data with students' academic records and anonymized the dataset using unique identifiers. This anonymous dataset was then transferred securely to EPRI for analysis.

The successful collection, consolidation and transfer of student data for this project was made possible by the significant collaboration and partnership between Mohawk College and EPRI, including the research teams and Institutional Research staff at each institution respectively.

4.2 Data

This subsection briefly describes the variables that are referred to in this report. The data used in this report reflect the students who attended the Start Smart program in Summer 2015 and started their first semester at Mohawk in Fall 2015. These students account for about one sixth of the entering Fall 2015 cohort.

4.2.a Variable Definitions

Background Variables

Background variables are related to the student and program characteristics. The set of background variables includes gender, age, school and credential. Age is categorized into four categories: under 18 years old, 18, 19 to 22, and 23 and older. School corresponds to the program in which the student is enrolled (there are seven schools). Credential includes five categories: diploma, advanced diploma, certificate, graduate certificate and degree.

The selection and final set of background variables used in this report is determined by the availability of data at Mohawk and also follows from a well-known and broadly used theoretical model by Tinto (1993) in the persistence literature. According to this model, students enter postsecondary education with various pre-entry characteristics such as age, race, gender, family structure, parental educational attainment, high school preparation, and their own skills and abilities. These factors contribute to the formation of the students' initial goals and their level of commitment to their studies. High school average data and assessment scores attained before the beginning of college, which are explained below, are also included in the models in this report.

Assessment Scores

Incoming students at Mohawk undertake writing, reading and mathematics assessments before the start of their first semester. The College Math Project (Orpwood, Schollen, Leek, Marinelli-Henriques, & Assiri, 2012) and the College Student Achievement Project (College Student Achievement Project Team, 2015) have studied and reported on the importance of these variables for student success in Ontario colleges over the last decade. At Mohawk, the reading and writing assessment is written on the Accuplacer platform and uses the Writeplacer software to write and score the essay. The math assessment, developed by Mohawk, is written on the Maple TA platform.

This report uses only the reading- and writing-assessment scores. Since there have been changes in the scales of these scores over the years, we rescore each assessment variable to reflect the student's relative position in the overall score distribution for the particular assessment they took. The proportion of students who took the reading and writing test is 83%. There are three categories, which range from 1 to 3, for the reading test and two categories (1 and 2) for the writing test. The lowest category for the reading test indicates that a student's score is in the lowest third of the score distribution, while the highest category indicates that the student's score is in the top third of the score distribution. Category 1 and 2 for the writing test indicate that the student's score is below or above the median score, respectively.[1]

1 Employing finer cuts for the assessment score distribution was not possible for some years due to the way the scores are distributed.

High School Average

High school grade average is one of the strongest predictors of retention for incoming students (Astin, 1997). Two versions of this variable are computed; one that is the average of the highest six grades of all courses taken over the first through fourth years of high school, and one that takes the average of courses over the third and fourth years alone. The categories for this variable are A plus, A, A minus, B plus, B, C plus, C, D plus, D and F.

Indicator for Leaving College Before Graduation

Another important variable of interest for this project is the leaving outcome (or dropout status) for each student. The leaving measure covers retention from the first to the second term.

The analysis uses day 10 of each term as the date to identify student retention, which corresponds to the end of the "add/drop" period at Mohawk. In other words, this is the last day in the term where students can register. Students who are registered on day 10 of the initial term are included in the analysis and are considered to have remained at Mohawk if they are registered again at day 10 of the second term.[2]

First-Term Grade Point Average (GPA)

Mohawk provides the first-term grade point average (GPA) of students as part of the term files. The zero entries for this variable were treated as missing. First-term GPA is computed on a scale of 100 points and it ranges from 1.5 to 98.9 in the sample.

Treatment Indicator

The treatment group includes i) those who finished the essay section (Stage I) of the project, but did not write the goals section (Stage II) completely, and ii) those who finished both the essay and goals sections.[3] The control group is the sample of students who did not take the Future Authoring workshop, but instead took Mohawk's usual goal-setting workshop, which does not involve a writing-intensive exercise. There are 387 and 391 students in the control and treatment groups, respectively.

4.2.b Sample Restrictions

We exclude students who are enrolled in Engineering Technology Preparatory, as there are only three students in this school.

2 The withdrawal status of those who return to the second semester is checked and those who withdraw before day 10 are also considered leavers. Some students who leave (particularly those who do not withdraw) will not have a second entry in this file. This allows the consideration of students who leave Mohawk but do not go through the formal withdrawal process.
3 There are 13 students who completed neither the goal nor the essay section. Inclusion of these students in the treatment sample does not affect the model estimates in a statistically meaningful way.

4.3 Experimental Design

Student orientation and transition programs, such as Start Smart, are a critical part of Mohawk's Student Success Plan. With this program, Mohawk endeavours to facilitate the development of an individualized "Future Ready Plan" for all participants to ensure they are prepared for their college experience.

Start Smart is promoted and made available to all applicants who have confirmed their offer of admission and plan on attending Mohawk College in the fall semester. Students who participated in the Start Smart program were recruited into this study as part of that program. There were no changes to the usual communication and marketing approach used by the college. All students began Start Smart in a large lecture theatre for a welcome and orientation session. As they signed-in for the program, they were each given a personal schedule for the day, which randomly placed students into two equally-sized streams.

The session immediately after the welcome session was called "Building Your Future Ready Plan." All students attended this session; however, one group was directed into labs for the Future Authoring writing exercise explained in Section 3, while the other half was directed into other classrooms for the typical goal-setting workshop. Both groups received the same information pamphlets, but the activities they engaged in were different.

This random assignment of students to these two separate workshops will enable us to obtain an unbiased estimate of the effect of the Future Authoring intervention on student outcomes.

4.4 Evaluation of Intervention Effects

Two sets of models are used to model retention and first-term GPAs. The decision to leave college early, which is a binary variable, is modelled using a logistic regression model. This model is used frequently in the education literature to model persistence (Grayson, 1998), as well as in broader economics literature to model other binary outcomes such as going to college (Long, 2004), being elected and migration decisions.

First-term GPAs are modelled using a linear regression model. The subsections below provide more details on these two sets of models.

Participation in the Future Authoring program was voluntary for those who were assigned to the program. Therefore, there is *non-compliance* in the treatment sample; that is, some students chose not to do or complete the Future Authoring workshop even if they were assigned to the program. The group of students who chose to complete the Future Authoring program is a self-selected subset of those who were offered treatment; a comparison of those who were treated and those who were in the control group would yield biased estimates for the treatment effect. This issue can be addressed by using an instrumental variables (IV) approach following Bloom (1984).

In this report, we present the *intention-to-treat* effect of the program, which is the causal effect of being assigned to the Future Authoring program, and aim to implement the IV strategy to estimate the average treatment effects of the program in future reports.

4.4.a Modelling Retention

The probability of leaving college early conditional on student characteristics and whether the student belongs to the treatment group $P(Leave|X)$ is modelled using the following logistic regression function:

$$P(Leave|X) = F(\beta_0 + \beta_T T + \beta_G G + \beta_A A + \beta_C C + \beta_S S + \beta_{HS} HS + \beta_{AR} AR + \beta_{AW} AW + u)$$

where $X = \{T, G, A, C, S, HS, AR, AW\}$, T denotes whether the student belongs to the treatment group, G is gender, A is age group, C is credential, S is school, HS is high school average, AR is reading-assessment score category (bottom, middle or top third of distribution), AW is writing-assessment score category (below median or above median), the β's are the parameters of the model representing the degree of association each variable has with probability of leaving conditional on other characteristics of the student, and u represents the unobserved factors (e.g. student's engagement in classes, financial status, neighbourhood characteristics, etc.) that affect a student's probability of leaving. $F(.)$ denotes the logistic function:

$$F(x) = \frac{e^x}{1 + e^x}$$

Each variable included in the model is a binary or categorical variable and the notations $(T, G, A, C\ S, HS, AR, AW)$ represent the set of indicators for each category, excluding the base category, of the relevant variable. The base category is the category that is omitted from regressions for each variable. The exclusion of the base category yields coefficient estimates that are used to get the estimated differences in tendencies to leave college early relative to that base category.

The base categories are the Control Group for T, Female for G, 18 for A, Advanced Diploma for C, Business for S, A minus for HS, Bottom Third for AR, and Below Median for AW. The indicator variables for each of these base categories are excluded from the regressions.

The models are estimated using maximum likelihood estimation. To aid in the interpretation of the results of the models, the average marginal effects calculated from the models will be presented instead of the actual coefficient estimates.[4] More precisely, first, individual predicted probabilities are computed given the coefficient estimates from the logistic regression models. Second, individual marginal effects are computed as differences between individual predicted probabilities of leaving for each category and the base category, and then averaged over all individuals to get the average marginal effect. The average marginal effects for

4 Linear probability models were also estimated for some of the model specifications and the results are similar to what we find with the logistic regression model.

the categorical variables can be interpreted as the percentage point change in the leaving rate for students with that characteristic relative to the base category.

The main average marginal effect of interest here is that of the treatment indicator, T. For this reason, we will only present those estimates in the main text.

The average marginal effect of T will represent the *intent-to-treat* effect of the Future Authoring program on the leaving rate; that is, by how much did the leaving rate increase or decrease in response to assignment to the program?

4.4.b Modelling First-Term GPA

The first-term GPA is modelled using a linear regression framework:

$$GPA = \beta_0 + \beta_T T + \beta_G G + \beta_A A + \beta_C C + \beta_S S + \beta_{HS} HS + \beta_{AR} AR + \beta_{AW} AW + u$$

where the variable notations are as explained in Section 0.

The models are estimated using ordinary least squares (OLS). The main coefficient of interest here is β_T, which represents the intent-to-treat effect of the Future Authoring intervention on first-term GPAs.

Both sets of models handle missing data by explicitly modeling the probability of leaving and first-term GPAs for students with missing variables. In particular, even in the case of a student with all the variables missing and only the dropout status or first-term GPA is observed, the model can provide a prediction for the probability of leaving or first-term GPA level for that student.

5. Mean Comparison Tests

This study has the design of a pure experimental research project, where the outcomes of treatment and control groups will be examined. Before looking at the effects of the intervention on student outcomes, we examine the characteristics of each group separately and test if there are distributional differences between the two groups.

Table 1 presents the proportions of students by gender, age, credential, school, high school average, reading-assessment score and writing-assessment score categories for the full sample as well as for the treatment and control groups, and tests whether the differences in proportions of control and treatment groups are statistically significant.[5]

5 The statistical test used for testing whether there are statistically significant differences in the proportions across treatment and control groups is the Wald test (Judge et al., 1985).

Overall, the distribution of student characteristics looks very similar for the treatment and control groups, but randomization of the treatment assignment may not be perfect as there are some differences in the credential and school distributions. However, these are unlikely to cause significant biases in the estimates for intent-to-treat effects once these variables are accounted for in the regression models in Section 7. More details on the distributions of student characteristics for control and treatment groups are provided below. We begin by looking at background variables.

The proportion of female students is 49% and 51%, respectively, for the control and treatment groups. The age composition differs slightly between the treatment and control groups, with students who are under 18, and 23 and older accounting for a higher proportion of students who are assigned to the treatment group. However, these differences are statistically insignificant.

For certificate and graduate-certificate students, students in skilled trades, and students who got an A plus in high school, the samples for control and treatment groups are not well balanced. Around 59% of certificate students, 18% of graduate-certificate students, 61% of skilled-trades students and 39% of A plus students are in the control group. These differences in proportions of control and treatment groups are statistically significant at a 5 significance level.

6. Descriptive Analysis of Student Outcomes

This section provides a simple descriptive analysis of how leaving rates and first-term GPAs differ between the control and treatment groups. This analysis will provide the first set of estimates for the intent-to-treat effects.

Table 2 reports the leaving rates and average first-term GPAs by different student characteristics and treatment status (control or treatment). We begin by looking at leaving rates.

6.1 Leaving Rates

Table 2 reports both the differences and relative differences in leaving rates for the control and treatment groups.

The treatment group tends to have lower leaving rates for almost all groups of students. The general pattern is that students with higher chances of leaving such as males, certificate students, students in Interdisciplinary Studies, and students with lower high school averages (over years three and four) have larger differences in their leaving rates between the treatment and control groups; that is, the intervention may benefit these students more than other students.

Overall, the leaving rate for the treatment group is 4.3 percentage points lower than the control group (10.5% versus 14.8%). This corresponds to a 29% lower leaving rate for the treatment group compared to the control group. This difference in leaving rates between the two groups shows that the Future Authoring intervention can have a decreasing effect on the overall leaving rate.

The female leaving rate is 11.7% and 11.3% for the control and treatment group, respectively, while the rate for males is considerably lower for the treatment group (9.1%) than the control group (17.1%), which shows that the intervention could benefit males more compared to females.

All age groups in the treatment group show lower leaving rates. The leaving rate for students who are under 18 is 12.8% and 8.9% in the control and treatment groups, respectively (around 4 percentage points lower in the treatment group). Other age groups also have leaving rates that are around 3 to 4 percentage points lower in the treatment group than the control group; that is, the intervention may not have differential effects for other age groups.

Looking at leaving rates by credential, the largest difference (10.2 percentage points) between the control and treatment groups is seen for certificate students (from 22.4% to 12.2%, respectively), while for other credentials, this difference is around 2.5 to 2.7 percentage points. For certificate students, this corresponds to a 45.6% lower leaving rate for the treatment group compared to control group, whereas for advanced diploma and diploma students the relative difference in leaving rates is 22.5% to 25.6%.

Students in Interdisciplinary Studies have a leaving rate that is 12.6 percentage points lower in the treatment group than those in the control group, which corresponds to a 61% lower leaving rate for the treatment group compared to the control group. This difference ranges between 1.7 and 6 percentage points (corresponding to 10% to 45% lower leaving rates for treatment groups) for other schools.

For high school average (taken over a student's third and fourth years of high school) categories, the largest difference (16.7 percentage points from 34% to 17.3%) in leaving rates is seen for students with a grade of B and below, followed by students with a B plus, A plus and then A minus students. Students who got an A average have higher leaving rates in the treatment group compared to the control group. The 16.7 percentage point difference in leaving rates for the treatment and control groups of students with a grade of B or below corresponds to a 50% lower leaving rate for the treatment group compared to the control group.

The leaving rates for students who did well (middle third, top third) in the reading assessment test are lower in the treatment group than the control group, whereas students who did poorly have similar leaving rates for the two groups.

The leaving rates are lower in the treatment group both for students who did poorly and those who did well in their writing assessment tests. The differences in leaving rates between the treatment and control groups are 3.7 and 5.5 percentage points for those who did poorly and those who did well, respectively.

6.2 First-Term GPAs

The treatment group tends to have higher first-term GPAs for almost all groups of students. Similar to the analysis of leaving rates, male students, students in Interdisciplinary Studies, and students with a lower high school average (over years one through four) have larger differences in their GPAs between the treatment

and control groups; however, these differences are very small in magnitude. There are also cases where students who typically have higher GPAs seem to have benefited more from the intervention.

The average first-term GPA for the treatment and control group students is 73.1 and 71.3, respectively. The difference between the GPAs is only around 1.8 grade points (2.6% difference), which is fairly small on a 100-point scale.

Average first-term GPA is around 68.2 and 71.2 in the control and treatment groups for males (3 grade point difference or 4.4% difference), whereas for females, the average first-term GPAs in the control and treatment groups are 74.2 and 74.9.

The largest increase (3.2 points or 4.8% change) in GPA from the control to the treatment group is seen for students who are 18, followed by those 23 and above.

Graduate certificate students saw the largest increase in their GPAs by 5.2 points, followed by certificate students with a 3.7-point increase in GPA.

Students in Interdisciplinary Studies typically have the lowest GPAs compared to other schools, at 63.4 and 69.1 in the control and treatment groups, respectively, which shows the largest increase (5.7-point or 8.9% increase). These students are followed by Technology and Media and Entertainment students, who also have one of the lowest GPAs among other schools, with around 3.7 to 3.8 point increases in their GPAs.

Looking at first-term GPAs by high school average categories calculated over the third and fourth years of high school, students who got a grade of B and below have a 3 percentage point or 5.2% lower leaving rate for the treatment group compared to the control group. These differences in first-term GPAs are lower in magnitude for other high school average categories.

First-term GPAs are usually lower for students who did poorly in the reading and writing assessments. The GPAs for those who did relatively well in their reading assessments increased from 69.4 to 72.9 and from 75.3 to 78.9 for those in the middle and top third of the score distribution, while those who did poorly remained at more or less the same GPA levels. On the other hand, when we look at students by their writing assessment scores, those who did poorly in their writing assessments have higher increases in their GPAs (by around 3 points versus 1 point) compared to those who did well.

Section 5 shows that there are some differences in the distributions of student characteristics between the treatment and control groups. Although most of these differences are small and statistically insignificant, the results for some of the variables (school and credential) in Table 1 suggest that the randomization may not be perfect. Therefore, it is worth adding these variables in the regressions for evaluating the intention-to-treat effects.

The next section presents the results from the regression models described in Section 4.4, which are used to evaluate the intent-to-treat effects of the Future Authoring program on student outcomes by taking into account the differences in student characteristics.

7. Intention-to-Treat Effects of the Future Authoring Program

Table 3, Table 4, and Table 5 present the estimation results for the intent-to-treat effects of the Future Authoring program on student outcomes (leaving rates and first-term GPAs). The results are presented both in terms of percentage-point differences and relative differences in leaving rates between treatment and control group. Table 3 presents the point estimates for the effects on the overall leaving rate and first-term GPA, and Table 4 and Table 5 present the results from the models that allow the effects to differ across different groups of students (e.g. males versus females, across different age groups, etc.).[6]

Assignment to treatment has a decreasing effect on the overall leaving rate by around 3.3 to 4.3 percentage points (Table 3). The point estimates tend to be larger in magnitude for students who typically have higher leaving rates (e.g. males versus females, certificate versus advanced diploma, Interdisciplinary Studies versus Business; a grade of B and below versus A minus).

The point estimates for the effects on first-term GPA are positive; however, these effects are generally very small in magnitude and statistically insignificant. We present the results in more detail below by first looking at the leaving rate effects.

7.1 Effects on Leaving Rates

7.1.a Overall Leaving Rate

Panel A of Table 3 shows the differences in average predicted probabilities of leaving, which is expressed in percentage points. Panel B shows the average predicted probabilities of leaving for treatment and control groups and the relative difference between these average predicted probabilities for the two groups.

The point estimates for the intent-to-treat effects are presented for different model specifications. The first model includes the treatment indicator only, the second model adds background variables (described in Section 4.2.a), excluding high school average variable, and the third model adds high school average and the assessment variables to the second model.

The model estimates suggest that the assignment to the Future Authoring program had a decreasing effect by 3.3 to 4.3 percentage points (corresponding to 26.8% to 31% lower predicted leaving rates for the treatment group), depending on the variable included in the model. The magnitude of the point estimate is reduced and no longer statistically significant when we include age, credential or school variables, which is expected due to differences in the distributions of students between the treatment and control groups as seen in Table 1.

6 Marginal effects for other control variables such as gender, age, credential, etc. are shown in Table A.1 in Appendix A.

7.1.b Effects by Student and Program Characteristics

Table 4 shows the model estimates for intent-to-treat effects by allowing for differences in the effectiveness of the Future Authoring intervention between different groups of students.

While the point estimates for females are fairly small and statistically insignificant, the negative effects are much higher in magnitude and statistically significant for males at the 5% and 10% significance level, depending on model specification.[7] The negative effect on male leaving rates is 5.9 to 8 percentage points, which corresponds to a 41% to 47% difference in leaving rates.

The estimates for age-specific treatment effects are all negative, but statistically insignificant, except for the full model specification for the 19 to 22 age group, which is around 6.7 percentage points. The point estimates, although not precisely estimated, show that, compared to students who are 18, the magnitude of the effect is higher (except in column 1) by 0.4 to 4 percentage points for the 19 to 22 age group, and more or less similar in magnitude for other groups.

The point estimates suggest that assignment to the Future Authoring program has a decreasing effect on leaving rates for all credential levels. Compared to advanced diploma students, the assignment has a larger negative impact (by 5 to 7 percentage points more in magnitude) on the leaving rate for certificate students; that is, the certificate students, who typically have higher leaving rates, could benefit more from the Future Authoring intervention. However, these estimated differences (not shown here) in effects are not precise enough to draw definitive conclusions.

Compared to Business students, the intervention has larger negative effects (by around 7.8 to 11.5 percentage points) for students in Interdisciplinary Studies, who typically have higher leaving rates. Similarly, the effects are larger in magnitude for Media & Entertainment students who also have higher leaving rates compared to Business students. The estimates suggest very small differences (and not always negative) for Skilled Trades compared to Business. However, none of the effects are statistically significant.

All high school average categories (calculated over the third and fourth years of high school) have seen a negative impact of the assignment on their leaving rates, except for students who attained an average of A, which is somewhat unexpected. The largest negative impact (12 to 17 percentage points) is seen for students who had an average of B and below. The estimates are statistically insignificant in the second and third specifications.

Students who scored in the top third of the reading-assessment score distribution benefited the most with a negative effect of around 7 to 9 percentage points from the intervention, followed by those in the middle

7 The differences in the point estimates for males and females are statistically insignificant.

third with negative effects of 3.6 to 5.1 percentage points. This is contrary to our expectations that the effects would be larger for those in the bottom third, who generally have higher leaving rates.[8]

Similarly, the students who scored higher in writing assessments benefited more from the intervention, but the effects cannot be precisely estimated.

7.2 Effects on First-Term GPAs

Table 3 shows that the point estimates for the impact of assignment to the program are positive and range between 1.35 and 1.84 points (out of 100) depending on the model specification, but these are statistically insignificant.

Table 5 shows that the point estimates for the intent-to-treat effects of the intervention on first-term GPA are positive for both females and males, but the effects are less than 1 point for females and insignificant, whereas for males the estimates range between 2.4 and 3 points. However, none of these estimates are statistically significant.

Similarly for other variables, the point estimates by age, credential, school and high school average are mostly positive, but very small and almost always statistically insignificant.

8. Limitations

This study has four limitations. First, although the assignment of students to the Future Authoring workshop is randomized, not all students in the treatment group completed both sections of the program. All students completed the essay section (Stage I). However, some students only described their goals in the goals section (Stage II), but did not complete the analysis of each of those goals (29% of treatment sample); and some did not describe any goals (22% of treatment group) and just completed the essay section. There may be unobserved factors that drive the decision to complete the whole project (essay and goals sections); that is, the completion of the treatment may not be fully random due to self-selection.

Second, the analysis of retention is based on historical data, which consists of the Fall 2015 cohort. That is, the results of this study are based on how students behaved in the fall of 2015. If student behaviour changes in the next cohorts (e.g., individuals drop out at generally different rates, or at relatively different rates across groups or student characteristics), the model will no longer reflect current behaviour; therefore, the model will need to be updated to account for these potential changes in underlying behaviour. This is inevitable in any empirical analysis.

8 None of the estimates for differences in effects are statistically significant. The effects could differ slightly if we were to estimate the average treatment effect instead of intent-to-treat effects.

Third, coefficients in the models that include interaction terms along with other student characteristics could be estimated with higher precision if sample sizes for treatment and control groups were larger. Finally, it should be noted that it is a common observation of student affairs practitioners that students who participate in summer orientation programs are often those who are, and may remain, highly engaged students.[9] Given that student engagement is a well-documented indicator of retention and student success, this intervention has likely only been tested on a specific sub-set of the incoming student population that may be more successful in any case. Testing this intervention in a more diverse classroom setting may further reduce selection bias and provide a more accurate look at its potential.

Non-completers are included in the treatment group as discussed throughout the report. The results are entirely driven by improvements in the outcomes of non-completers; that is, non-completers — who do not get the full potential of the program — benefit more. This may seem counter-intuitive, but we can hypothesize that the benefits of even this partial treatment are strong. The benefits could be even greater if this group could be persuaded to complete the treatment, perhaps through some incentive or simply by providing additional motivational instructions, which could only be known through further research.

In future work, this potential issue of self-selection within the treatment group could be controlled for by using *instrumental* variables that are correlated with the decision to complete the project but not correlated with the decision to leave college early or first-term GPAs. Bloom (1984) suggests using the assignment status as an instrumental variable for the treatment status. Assignment status is, by construction, random and should be unrelated to any unobserved characteristics of students and also highly correlated with the treatment status.

Another way to minimize the issue of self-selection within the treatment group may rely on redesigning the experiment and/or its administration without compromising the integrity of the exercise. One way could be to reduce the total number of sections by, for example, limiting the whole Future Authoring session to writing the essay section. This way, the total time required to complete the project could be around 15 to 20 minutes. Another way could be to keep the Future Authoring session as is, but implement the session as a requirement by making it a part of a course or giving students an incentive to complete the whole session by offering financial compensation upon full completion of the project.

9. Conclusions and Future Work

This research project used institutional data from Mohawk College to evaluate the effectiveness of the Future Authoring program for improving student success (retention and first-term GPA) using an experimental research design. The models used to estimate the treatment effect of the intervention utilized a wide variety of variables, including demographic characteristics, program and credential information, high school grades and post-admission assessment scores.

9 We could speculate that the effects of treatment could be higher for the more general student body, for which the leaving rates are higher. The leaving rate for Start Smart participants is 12.8% while the leaving rate for the whole cohort is 15%.

The results demonstrated that i) the point estimates for the intent-to-treat effects of intervention on leaving rates are negative and the magnitudes range between 3.3 to 4.3 percentage points depending on the model specification, and that ii) the point estimates tend to be larger in magnitude for students who tend to have higher leaving rates such as males, certificate students, students in Interdisciplinary Studies and students with low high school averages. However, these estimated differences across groups in the effects of the intervention are not precise enough to draw definitive conclusions.

The results also showed that the estimates for the intent-to-treat effects of the Future Authoring intervention on first-term GPAs are positive; however, these estimates are very small in magnitude and statistically insignificant.

The goal of future research will be to track the Fall 2015 cohort and the retention and first-term GPA outcomes through March 2019 to examine the intervention's effects on different retention measures (e.g., from semester one to three, two-year and three-year retention) and GPAs based on longer periods of study (e.g., first-year GPA, GPA at graduation). This will help us understand whether the Future Authoring program has long-term effects on student outcomes.

In addition, another element of future work will be to relate the word count of the student's Future Authoring submission, which can be thought of as a proxy for student effort, to the student's outcomes.

Implications for practice include consideration for scaling the program to a broader and more diverse audience to maximize the potential improvements to retention. As an online program, there is the potential to provide this as an orientation intervention for all students to do at home (rather than in person), as a resource for advisers and counsellors, or perhaps as a key class assignment in specific first-semester courses across programs. A good place to start may be by targeting students who seem most likely to benefit from the intervention, including those in male-dominated programs such as business, technology or the trades. While more research is necessary to replicate and validate the significance of the effects on men and those students traditionally most at-risk of leaving college early, the potential for an intervention making such a difference is important, especially since Mohawk has observed that men typically have lower retention rates than women.

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Table 1: Descriptive Statistics: Full Sample and Control and Treatment Groups

Group	Full Sample		Distribution of Control and Treatment Groups[1]		Mean Comparison Test (p-value)[2]
	Distribution (%)	Leaving Rate (%)	Control (%)	Treatment (%)	
Full Sample	100	13	50	50	-
Gender					
Female	51	12	49	51	0.73
Male	49	13	50	50	0.92
Missing	1	100	67	33	0.62
Total	100		50	50	
Age					
Below 18	10	11	46	54	0.51
18	36	16	51	49	0.72
19-22	31	13	51	49	0.79
23 and above	22	7	47	53	0.41
Missing	1	100	100	0	
Total	100		50	50	
Credential					
Advanced Diploma	28	10	48	52	0.59
Certificate	16	18	59	41	0.07*
Degree	1	100	43	57	0.72
Diploma	54	9	49	51	0.70
Graduate Certificate	1	0	18	82	0.01***
Missing	2	100	58	42	0.58
Total	100		50	50	
School					
Business	14	11	52	48	0.70
Community and Justice Studies	24	8	44	56	0.10
Health Sciences	5	19	42	58	0.25
Interdisciplinary Studies	9	15	58	42	0.24
Media and Entertainment	12	10	52	48	0.67
Skilled Trades	11	16	61	39	0.06*
Technology	23	10	48	52	0.61
Missing	2	100	58	42	0.58
Total	100		50	50	
High School Average (3-4 years)					
B and below	12	25	47	53	0.62
B plus	17	17	57	43	0.14
A minus	21	10	49	51	0.81

Group	Full Sample		Distribution of Control and Treatment Groups[1]		Mean Comparison Test (p-value)[2]
	Distribution (%)	Leaving Rate (%)	Control (%)	Treatment (%)	
A	25	10	51	49	0.88
A plus	9	13	39	61	0.03**
Missing	16	6	53	48	0.59
Total	100		50	50	
Reading-Assessment Score Category					
Bottom Third	26	14	46	54	0.22
Middle Third	28	11	51	49	0.79
Top Third	29	7	53	47	0.45
Missing	17	22	50	50	0.93
Total	100		50	50	
Writing-Assessment Score Category					
Below Median	56	13	49	51	0.70
Above Median	27	6	52	48	0.52
Missing	17	21	48	52	0.67
Total	100		50	50	

[1] There are 387 and 391 students in the control and treatment groups.
[2] Mean comparison test: The statistical test used for testing whether there are statistically significant differences in the proportions across treatment and control groups is the Wald test (Judge et al., 1985). The p-values from this test are shown. * p<0.10 ** p<0.05 *** p<0.01.

Table 2: Leaving Rate, Average First-Term GPA and Sample Sizes by Student Characteristics and Treatment Status

Group	Leaving Rate (%)				First Term GPA (Out of 100)			
	Control	Treatment	Difference	Relative Diff. (%)[1]	Control	Treatment	Difference	Relative Diff. (%)
All	14.8	10.5	-4.3	-29.0	71.3	73.1	1.8	2.6
Gender								
Female	11.7	11.3	-0.4	-3.4	74.2	74.9	0.6	0.9
Male	17.1	9.1	-8.0	-46.6	68.2	71.2	3.0	4.4
Missing	100	100	0.0	0.0			-	-
Age								
Below 18	12.8	8.9	-3.9	-30.7	68.7	67.8	-0.9	-1.3
18	17.3	14.1	-3.2	-18.5	67.2	70.5	3.2	4.8
19-22	14.3	11.4	-2.9	-20.2	70.7	70.9	0.2	0.3
23 and above	9.4	5.2	-4.2	-44.7	79.9	82.1	2.2	2.8
Missing	100		-	-	-	-	-	-
Credential								
Advanced Diploma	11.2	8.7	-2.5	-22.5	70.0	70.4	0.3	0.5
Certificate	22.4	12.2	-10.2	-45.6	66.6	70.3	3.7	5.6
Degree	100	100	0.0	0.0	-	-	-	-
Diploma	10.6	7.9	-2.7	-25.6	73.1	74.6	1.4	2.0
Graduate Certificate	0	0	0.0	-	80.1	85.2	5.2	6.4
Missing	100	100	0.0	0.0	-	-	-	-
School								
Business	12.5	9.6	-2.9	-23.1	74.2	73.5	-0.7	-0.9
Comm. and Justice	9.8	6.9	-2.9	-29.5	75.3	73.2	-2.1	-2.8
Health Sciences	20.0	17.9	-2.1	-10.7	78.4	79.3	0.9	1.1
Interdis. Stud.	20.6	8.0	-12.6	-61.1	63.4	69.1	5.7	8.9
Media and Ent.	13.3	7.3	-6.0	-45.1	66.6	70.3	3.7	5.5
Skilled Trades	17.1	15.4	-1.7	-9.9	70.5	73.1	2.7	3.8
Technology	11.1	9.3	-1.8	-16.5	69.6	73.4	3.8	5.5
Missing	100	100	0.0	0.0	-	-	-	-

Group	Leaving Rate (%)				First Term GPA (Out of 100)			
	Control	Treatment	Difference	Relative Diff. (%)[1]	Control	Treatment	Difference	Relative Diff. (%)
High School Average (Years 3-4)								
B and below	34.0	17.3	-16.7	-49.2	58.0	61.0	3.0	5.2
B plus	20.0	12.0	-8.0	-40.0	63.3	65.6	2.3	3.6
A minus	12.5	7.2	-5.3	-42.2	69.6	71.7	2.1	3.0
A	8.5	12.0	3.4	40.5	73.9	76.3	2.4	3.2
A plus	16.7	10.7	-6.0	-35.7	82.0	81.9	-0.2	-0.2
Missing	6.3	5.3	-1.1	-17.1	81.4	80.3	-1.2	-1.5
Reading-Assessment Score Category								
Bottom Third	14.1	14.4	0.3	1.9	66.3	67.2	0.9	1.3
Middle Third	13.6	8.5	-5.1	-37.7	69.4	72.9	3.5	5.0
Top Third	10.9	2.0	-8.9	-81.5	75.3	78.9	3.6	4.8
Missing	24.2	19.4	-4.8	-20.0	75.7	75.4	-0.3	-0.4
Writing-Assessment Score Category								
Below Median	14.8	11.1	-3.7	-25.0	67.3	70.2	2.9	4.2
Above Median	8.7	3.2	-5.5	-63.5	77.1	78.2	1.1	1.5
Missing	24.2	18.3	-5.9	-24.5	75.7	75.8	0.1	0.2

[1] Relative differences take the control group as the base group.

Table 3: Model Estimates of Treatment Effects

	Leaving Rate			First Term GPA		
	(1) No control variables	(2) Student background (excluding high school avg)[2]	(3) All control variables[3]	(1) No control variables	(2) Student background (excluding high school avg)	(3) All control variables
Panel A: Model Estimates of Treatment Effects[1]						
	-0.043*	-0.033	-0.039*	1.84	1.35	1.43
	(0.024)	(0.022)	(0.022)	(1.27)	(1.20)	(1.08)
Panel B: Predicted Probabilities of Leaving for Treatment and Control Groups						
Control Group	0.148	0.122	0.125	71.28	71.53	71.49
Treatment Group	0.105	0.089	0.087	73.12	72.88	72.92
Difference	-0.043	-0.033	-0.038	1.84	1.35	1.43
Relative Difference (%)	-29	-26.8	-31	2.58	1.89	2
Observations	775	745	745	729	729	729

[1] Standard errors are in parantheses. Credential categories Degree and Graduate Certificate are dropped from the regressions due to multicollinearity. Engineering Technology Preparatory is also dropped from the regressions since there are only 3 students in this school. Notations: * p<0.10 ** p<0.05 *** p<0.01.

[2] Column (2) adds age, credential, and school variables.

[3] Column (3) adds high school average, writing and reading assessment variables to column (2).

Table 4: Model Estimates of Treatment Effects on Leaving Rates by Student and Program Characteristics[1]

	Model Estimates of Treatment Effects			Predicted Probabilities of Leaving for Treatment and Control Groups			
	(1) No control variables	(2) Student background (excluding high school avg)[2]	(3) All control variables[3]		(1) No control variables	(2) Student background (excluding high school avg)[2]	(3) All control variables[3]
By Gender							
Female	-0.004	-0.007	-0.017	Control	0.117	0.095	0.100
	(0.032)	(0.029)	(0.029)	Treatment	0.113	0.088	0.083
				Difference	-0.004	-0.007	-0.017
				Relative Diff. (%)	-3.4	-7.7	-17
Male	-0.080**	-0.059*	-0.062*	Control	0.171	0.150	0.152
	(0.035)	(0.034)	(0.033)	Treatment	0.091	0.091	0.090
				Difference	-0.080	-0.059	-0.062
				Relative Diff. (%)	-46.6	-39.5	-40.9
By Age							
Below 18	-0.039	-0.031	-0.029	Control	0.128	0.102	0.100
	(0.068)	(0.060)	(0.061)	Treatment	0.089	0.070	0.071
				Difference	-0.039	-0.031	-0.029
				Relative Diff. (%)	-30.7	-30.9	-29
18	-0.032	-0.024	-0.026	Control	0.173	0.150	0.151
	(0.044)	(0.042)	(0.042)	Treatment	0.141	0.125	0.125
				Difference	-0.032	-0.024	-0.026
				Relative Diff. (%)	-18.5	-16.2	-17.4
19-22	-0.029	-0.050	-0.067*	Control	0.143	0.134	0.144
	(0.044)	(0.041)	(0.040)	Treatment	0.114	0.084	0.077
				Difference	-0.029	-0.05	-0.067
				Relative Diff. (%)	-20.2	-37.5	-46.3

	Model Estimates of Treatment Effects			Predicted Probabilities of Leaving for Treatment and Control Groups			
	(1) No control variables	(2) Student background (excluding high school avg)[2]	(3) All control variables [3]		(1) No control variables	(2) Student background (excluding high school avg)[2]	(3) All control variables[3]
23 and above	-0.042	-0.023	-0.026	Control	0.094	0.071	0.073
	(0.039)	(0.037)	(0.036)	Treatment	0.052	0.048	0.047
				Difference	-0.042	-0.023	-0.026
				Relative Diff. (%)	-44.7	-31.9	-35.7
By Credential							
Certificate	-0.102	-0.098	-0.090	Control	0.224	0.222	0.218
	(0.075)	(0.074)	(0.073)	Treatment	0.122	0.124	0.127
				Difference	-0.102	-0.098	-0.091
				Relative Diff. (%)	-45.6	-44.3	-41.5
Diploma	-0.027	-0.021	-0.027	Control	0.106	0.103	0.106
	(0.028)	(0.028)	(0.027)	Treatment	0.079	0.081	0.079
				Difference	-0.027	-0.022	-0.027
				Relative Diff. (%)	-25.6	-20.9	-25.3
Advanced Diploma	-0.025	-0.025	-0.040	Control	0.112	0.112	0.121
	(0.040)	(0.040)	(0.041)	Treatment	0.087	0.087	0.081
				Difference	-0.025	-0.025	-0.04
				Relative Diff. (%)	-22.5	-22.5	-32.9
By School							
Business	-0.029	-0.022	-0.028	Control	0.125	0.125	0.127
	(0.060)	(0.063)	(0.060)	Treatment	0.096	0.102	0.100
				Difference	-0.029	-0.023	-0.027
				Relative Diff. (%)	-23.1	-17.8	-21.7
Comm. and Justice Studies	-0.029	-0.029	-0.041	Control	0.098	0.100	0.108
	(0.039)	(0.040)	(0.040)	Treatment	0.069	0.071	0.067

	Model Estimates of Treatment Effects			Predicted Probabilities of Leaving for Treatment and Control Groups			
	(1) No control variables	(2) Student background (excluding high school avg)[2]	(3) All control variables[3]		(1) No control variables	(2) Student background (excluding high school avg)[2]	(3) All control variables[3]
				Difference	-0.029	-0.029	-0.041
				Relative Diff. (%)	-29.5	-29	-37.8
Health Sciences	-0.021	-0.011	0.004	Control	0.200	0.057	0.050
	(0.115)	(0.069)	(0.065)	Treatment	0.179	0.046	0.053
				Difference	-0.021	-0.011	0.003
				Relative Diff. (%)	-10.7	-19.3	7.2
Interdisciplinary Studies	-0.126	-0.122	-0.113	Control	0.206	0.203	0.198
	(0.088)	(0.087)	(0.087)	Treatment	0.080	0.082	0.085
				Difference	-0.126	-0.121	-0.113
				Relative Diff. (%)	-61.1	-59.8	-57.2
Media and Entertainment	-0.060	-0.050	-0.058	Control	0.133	0.127	0.132
	(0.065)	(0.062)	(0.058)	Treatment	0.073	0.077	0.074
				Difference	-0.06	-0.05	-0.058
				Relative Diff. (%)	-45.1	-39.2	-43.9
Skilled Trades	-0.017	-0.024	-0.032	Control	0.171	0.173	0.177
	(0.092)	(0.093)	(0.088)	Treatment	0.154	0.150	0.145
				Difference	-0.017	-0.023	-0.032
				Relative Diff. (%)	-9.9	-13.6	-18.2
Technology	-0.018	-0.014	-0.022	Control	0.111	0.109	0.113
	(0.044)	(0.044)	(0.044)	Treatment	0.093	0.095	0.091
				Difference	-0.018	-0.014	-0.022

	Model Estimates of Treatment Effects			Predicted Probabilities of Leaving for Treatment and Control Groups			
	(1) No control variables	(2) Student background (excluding high school avg)[2]	(3) All control variables[3]		(1) No control variables	(2) Student background (excluding high school avg)[2]	(3) All control variables[3]
				Relative Diff. (%)	-16.5	-13.1	-19.4
By High School Average (years 3-4)							
B and below	-0.167*	-0.116	-0.129	Control	0.340	0.308	0.315
	(0.087)	(0.088)	(0.088)	Treatment	0.173	0.192	0.187
				Difference	-0.167	-0.116	-0.128
				Relative Diff. (%)	-49.2	-37.6	-40.8
B plus	-0.080	-0.076	-0.085	Control	0.200	0.186	0.191
	(0.068)	(0.069)	(0.067)	Treatment	0.120	0.110	0.106
				Difference	-0.08	-0.076	-0.085
				Relative Diff. (%)	-40	-40.8	-44.5
A minus	-0.053	-0.050	-0.063	Control	0.125	0.123	0.131
	(0.047)	(0.046)	(0.047)	Treatment	0.072	0.073	0.069
				Difference	-0.053	-0.05	-0.062
				Relative Diff. (%)	-42.2	-40.3	-47.7
A	0.034	0.030	0.025	Control	0.085	0.063	0.065
	(0.044)	(0.041)	(0.040)	Treatment	0.120	0.094	0.091
				Difference	0.035	0.031	0.026
				Relative Diff. (%)	40.5	48	38.2
A plus	-0.060	-0.082	-0.074	Control	0.167	0.120	0.114
	(0.075)	(0.062)	(0.060)	Treatment	0.107	0.039	0.040
				Difference	-0.06	-0.081	-0.074
				Relative Diff. (%)	-35.7	-67.9	-64.8

	Model Estimates of Treatment Effects			Predicted Probabilities of Leaving for Treatment and Control Groups			
	(1) No control variables	(2) Student background (excluding high school avg)[2]	(3) All control variables[3]		(1) No control variables	(2) Student background (excluding high school avg)[2]	(3) All control variables[3]
By Reading-Assessment Score							
Bottom Third	0.003	0.005	-0.002	Control	0.141	0.141	0.145
	(0.048)	(0.049)	(0.049)	Treatment	0.144	0.146	0.143
				Difference	0.003	0.005	-0.002
				Relative Diff. (%)	1.9	3.6	-1.2
Middle Third	-0.051	-0.036	-0.046	Control	0.136	0.128	0.133
	(0.042)	(0.043)	(0.041)	Treatment	0.085	0.092	0.087
				Difference	-0.051	-0.036	-0.046
				Relative Diff. (%)	-37.7	-28.4	-34.6
Top Third	-0.089***	-0.082**	-0.073**	Control	0.109	0.104	0.098
	(0.033)	(0.032)	(0.032)	Treatment	0.020	0.022	0.024
				Difference	-0.089	-0.082	-0.074
				Relative Diff. (%)	-81.5	-78.9	-75.2
Missing	-0.048	-0.034	-0.035	Control	0.242	0.112	0.113
	(0.072)	(0.056)	(0.053)	Treatment	0.194	0.078	0.078
				Difference	-0.048	-0.034	-0.035
				Relative Diff. (%)	-20	-30.4	-31.1
By Writing-Assessment Score							
Below Median	-0.037	-0.027	-0.037	Control	0.148	0.143	0.148
	0.032	0.032	0.032	Treatment	0.111	0.116	0.111
				Difference	-0.037	-0.027	-0.037
				Relative Diff. (%)	-25	-18.9	-25.1
Above Median	-0.055*	-0.051	-0.045	Control	0.087	0.084	0.081

	Model Estimates of Treatment Effects				Predicted Probabilities of Leaving for Treatment and Control Groups		
	(1) No control variables	(2) Student background (excluding high school avg)[2]	(3) All control variables [3]		(1) No control variables	(2) Student background (excluding high school avg)[2]	(3) All control variables[3]
	(0.033)	(0.033)	(0.032)	Treatment	0.032	0.034	0.036
				Difference	-0.055	-0.05	-0.045
				Relative Diff. (%)	-63.5	-60.1	-56.1
Missing	-0.059	-0.037	-0.034	Control	0.242	0.111	0.110
	(0.070)	(0.055)	(0.052)	Treatment	0.183	0.074	0.075
				Difference	-0.059	-0.037	-0.035
				Relative Diff. (%)	-24.5	-33.3	-31.2
Observations	772	745	745				

[1] The regressions in this table include different sets of interactions with the treatment variable in each panel. Results in "By Gender" panel includes gender interaction terms with the treatment variable to allow for differential treatment effects for males and females. The coefficients for other variables in the regressions (e.g. age, credential, school, etc.) are assumed to be the same across different groups. This also holds for other panels in the table. The left panel "Estimates of Treatment Effects" shows the difference in average predicted probabilities of leaving for treatment and control groups and their standard errors. Using the coefficient estimates from the logistic regressions, the marginal effect for each individual is calculated at the individual values for variables and then the individual marginal effects are averaged to get the estimates for "intent-to-treat" effects. The right panel "Predicted Probabilities of Leaving for Treatment and Control Groups" shows the average predicted probabilities of leaving separately for control and treatment groups and also shows the relative difference between these average probabilities. Credential categories Degree and Graduate Certificate are dropped from the regressions due to multicollinearity. Engineering Technology Preparatory is also dropped from the regressions since there are only 3 students in this school. Notations: * p<0.10 ** p<0.05 *** p<0.01.

[2] Column (2) adds age, credential, and school variables.

[3] Column (3) adds high school average, writing and reading assessment variables to column (2).

Table 5: Model Estimates of Treatment Effects on GPA by Student and Program Characteristics[1]

	Model Estimates of Treatment Effects				Predicted GPA for Treatment and Control Groups		
	(1)	(2)	(3)		(1)	(2)	(3)
	No control variables	Student background (excluding high school avg)[2]	All control variables[3]		No control variables	Student background (excluding high school avg)[2]	All control variables[3]
By Gender							
Female	0.65	0.07	0.48	Control	74.24	74.53	74.32
	(1.58)	(1.51)	(1.36)	Treatment	74.88	74.60	74.80
				Difference	0.64	0.07	0.48
				Relative Diff. (%)	0.86	0.09	0.65
Male	3.02	2.70	2.42	Control	68.23	68.39	68.53
	(1.96)	(1.89)	(1.72)	Treatment	71.24	71.09	70.95
				Difference	3.01	2.70	2.42
				Relative Diff. (%)	4.41	3.95	3.53
By Age							
18	3.23	2.76	2.55	Control	68.67	68.31	68.94
	(2.17)	(2.17)	(1.89)	Treatment	67.76	68.04	67.56
				Difference	-0.91	-0.27	-1.38
				Relative Diff. (%)	-1.33	-0.40	-2.00
Below 18	-0.91	-1.38	-1.39	Control	67.23	67.48	67.46
	(3.67)	(3.73)	(3.39)	Treatment	70.45	70.20	70.22
				Difference	3.22	2.72	2.76
				Relative Diff. (%)	4.79	4.03	4.09
19-22	0.23	0.15	0.85	Control	70.70	70.66	70.74
	(2.32)	(2.26)	(2.06)	Treatment	70.93	70.97	70.89
				Difference	0.23	0.31	0.15
				Relative Diff. (%)	0.33	0.44	0.21
23 and above	2.21	1.96	1.79	Control	79.89	79.71	80.02

	Model Estimates of Treatment Effects				Predicted GPA for Treatment and Control Groups		
	(1)	(2)	(3)		(1)	(2)	(3)
	No control variables	Student background (excluding high school avg)[2]	All control variables[3]		No control variables	Student background (excluding high school avg)[2]	All control variables[3]
	(1.96)	(1.92)	(1.99)	Treatment	82.09	82.26	81.98
				Difference	2.20	2.55	1.96
				Relative Diff. (%)	2.75	3.20	2.45
By Credential							
Advanced Diploma	0.34	0.48	1.24	Control	70.04	69.97	69.58
	(2.47)	(2.38)	(2.13)	Treatment	70.38	70.45	70.82
				Difference	0.34	0.48	1.24
				Relative Diff. (%)	0.49	0.69	1.78
Certificate	3.72	4.16	1.69	Control	66.57	66.38	67.42
	(4.32)	(4.17)	(3.68)	Treatment	70.29	70.54	69.11
				Difference	3.72	4.16	1.69
				Relative Diff. (%)	5.59	6.27	2.51
Diploma	1.45	1.06	1.41	Control	73.14	73.34	73.16
	(1.53)	(1.44)	(1.32)	Treatment	74.59	74.40	74.57
				Difference	1.45	1.06	1.41
				Relative Diff. (%)	1.98	1.45	1.93
Grad. Certificate	5.16*	7.82**	4.89	Control	80.08	77.91	80.30
	(3.08)	(3.54)	(3.49)	Treatment	85.24	85.72	85.19
				Difference	5.16	7.81	4.89
				Relative Diff. (%)	6.44	10.02	6.09
By School							
Business	-0.70	-0.48	0.38	Control	74.25	74.14	73.72
	(3.21)	(2.98)	(2.69)	Treatment	73.55	73.66	74.10
				Difference	-0.70	-0.48	0.38
				Relative Diff. (%)	-0.01	-0.01	0.01

	Model Estimates of Treatment Effects				Predicted GPA for Treatment and Control Groups		
	(1)	(2)	(3)		(1)	(2)	(3)
	No control variables	Student background (excluding high school avg)[2]	All control variables[3]		No control variables	Student background (excluding high school avg)[2]	All control variables[3]
Comm. and Justice Studies	-2.08	-1.76	-1.01	Control	75.26	75.08	74.65
	(2.16)	(2.10)	(1.95)	Treatment	73.18	73.32	73.65
				Difference	-2.08	-1.76	-1.00
				Relative Diff. (%)	-2.76	-2.34	-1.34
Health Sciences	0.86	0.57	-1.80	Control	78.39	78.56	79.95
	(3.91)	(3.32)	(3.18)	Treatment	79.25	79.13	78.15
				Difference	0.86	0.57	-1.80
				Relative Diff. (%)	1.10	0.73	-2.25
Interdisciplinary Studies	5.66	5.26	3.27	Control	63.45	63.62	64.49
	(5.03)	(5.04)	(4.14)	Treatment	69.11	68.88	67.76
				Difference	5.66	5.26	3.27
				Relative Diff. (%)	8.92	8.27	5.07
Media and Entertainment	3.69	2.85	2.62	Control	66.64	67.04	67.15
	(3.88)	(3.79)	(3.26)	Treatment	70.33	69.89	69.77
				Difference	3.69	2.85	2.62
				Relative Diff. (%)	5.54	4.25	3.90
Skilled Trades	2.65	2.97	3.25	Control	70.45	70.33	70.22
	(4.22)	(3.97)	(3.63)	Treatment	73.10	73.30	73.47
				Difference	2.65	2.97	3.25
				Relative Diff. (%)	3.76	4.22	4.63
Technology	3.85	3.50	3.63	Control	69.59	69.77	69.71
	(2.77)	(2.62)	(2.38)	Treatment	73.44	73.27	73.33

	Model Estimates of Treatment Effects				Predicted GPA for Treatment and Control Groups		
	(1)	(2)	(3)		(1)	(2)	(3)
	No control variables	Student background (excluding high school avg)[2]	All control variables[3]		No control variables	Student background (excluding high school avg)[2]	All control variables[3]
				Difference	3.85	3.50	3.62
				Relative Diff. (%)	5.53	5.02	5.19
By High School Average (years 3-4)							
A minus	2.11	2.90	4.03*	Control	69.62	69.22	68.64
	(2.43)	(2.43)	(2.41)	Treatment	71.73	72.12	72.67
				Difference	2.11	2.90	4.03
				Relative Diff. (%)	3.03	4.19	5.87
B and below	3.02	1.58	2.20	Control	58.02	58.82	58.47
	(5.07)	(4.66)	(4.70)	Treatment	61.04	60.39	60.67
				Difference	3.02	1.57	2.20
				Relative Diff. (%)	5.21	2.67	3.76
B plus	2.29	2.07	2.75	Control	63.27	63.36	63.07
	(3.40)	(3.01)	(3.05)	Treatment	65.56	65.43	65.82
				Difference	2.29	2.07	2.75
				Relative Diff. (%)	3.62	3.27	4.36
A	2.37	1.14	1.58	Control	73.89	74.50	74.28
	(1.97)	(1.96)	(1.89)	Treatment	76.26	75.64	75.86
				Difference	2.37	1.14	1.58
				Relative Diff. (%)	3.21	1.53	2.13
A plus	-0.16	0.37	-0.44	Control	82.02	81.69	82.19
	(2.08)	(2.19)	(1.96)	Treatment	81.86	82.06	81.75
				Difference	-0.16	0.37	-0.44
				Relative Diff. (%)	-0.20	0.45	-0.54

	Model Estimates of Treatment Effects				Predicted GPA for Treatment and Control Groups		
	(1)	(2)	(3)		(1)	(2)	(3)
	No control variables	Student background (excluding high school avg)[2]	All control variables[3]		No control variables	Student background (excluding high school avg)[2]	All control variables[3]
Missing	-1.19	-2.15	-3.01	Control	81.45	81.90	82.31
	(2.16)	(2.25)	(2.21)	Treatment	80.26	79.75	79.30
				Difference	-1.19	-2.15	-3.01
				Relative Diff. (%)	-1.46	-2.63	-3.66
By Reading-Assessment Score							
Bottom Third	0.87	0.77	1.46	Control	66.34	66.40	66.02
	(2.32)	(2.32)	(2.26)	Treatment	67.21	67.16	67.48
				Difference	0.87	0.76	1.46
				Relative Diff. (%)	1.31	1.14	2.21
Middle Third	3.48	2.85	3.57*	Control	69.38	69.68	69.33
	(2.31)	(2.18)	(1.92)	Treatment	72.85	72.53	72.90
				Difference	3.47	2.85	3.57
				Relative Diff. (%)	5.00	4.09	5.15
Top Third	3.59*	3.04	0.62	Control	75.33	75.60	76.76
	(2.18)	(2.09)	(1.94)	Treatment	78.93	78.64	77.38
				Difference	3.60	3.04	0.62
				Relative Diff. (%)	4.78	4.02	0.81
Missing	-0.31	-1.42	-1.24	Control	75.67	76.23	76.14
	(3.40)	(3.16)	(2.78)	Treatment	75.36	74.81	74.90
				Difference	-0.31	-1.42	-1.24
				Relative Diff. (%)	-0.41	-1.86	-1.63
By Writing-Assessment Score							
Below Median	2.86*	2.47	3.10**	Control	67.31	67.51	67.19
	(1.69)	(1.62)	(1.49)	Treatment	70.17	69.98	70.29

	Model Estimates of Treatment Effects				Predicted GPA for Treatment and Control Groups		
	(1)	(2)	(3)		(1)	(2)	(3)
	No control variables	Student background (excluding high school avg)[2]	All control variables[3]		No control variables	Student background (excluding high school avg)[2]	All control variables[3]
				Difference	2.86	2.47	3.10
				Relative Diff. (%)	4.25	3.66	4.61
Above Median	1.14	1.23	-0.76	Control	77.09	77.04	78.00
	(2.01)	(2.00)	(1.80)	Treatment	78.23	78.28	77.25
				Difference	1.14	1.24	-0.75
				Relative Diff. (%)	1.48	1.61	-0.96
Missing	0.13	-1.26	-1.21	Control	75.67	76.41	76.38
	(3.32)	(3.07)	(2.77)	Treatment	75.80	75.14	75.17
				Difference	0.13	-1.27	-1.21
				Relative Diff. (%)	0.17	-1.66	-1.58

[1] The regressions in this table include different sets of interactions with the treatment variable in each horizontal panel. Results in "By Gender" panel includes gender interaction terms with the treatment variable to allow for differential treatment effects for males and females. The coefficients for other variables in the regressions (e.g. age, credential, school, etc.) are assumed to be the same across different groups. This also holds for other panels in the table. The left panel "Estimates of Treatment Effects" shows the difference in average predicted GPAs for treatment and control groups and their standard errors for each group. The right panel "Predicted GPAs for Treatment and Control Groups" shows the average predicted GPAs separately for control and treatment groups and also shows the relative difference between these average predicted GPAs. Standard errors are in parentheses. All GPA entries for credential Degree are missing. Engineering Technology Preparatory is dropped from the regressions since there are only 3 students in this school. Notations: * p<0.10 ** p<0.05 *** p<0.01.

[2] Column (2) adds age, credential, and school variables.

[3] Column (3) adds high school average, writing and reading assessment variables to column (2).

Appendix A

Table A-1: Full Model Estimates of Treatment Effects

	Leaving Rate			First Term GPA		
	(1) No control variables	(2) Student background (excluding high school avg)[2]	(3) All control variables[3]	(1) No control variables	(2) Student background (excluding high school avg)	(3) All control variables
Panel A: Model Estimates of Treatment Effects[1]						
	-0.043*	-0.033	-0.039*	1.84	1.35	1.43
	(0.024)	(0.022)	(0.022)	(1.27)	(1.20)	(1.08)
Panel B: Model Estimates of Marginal Effects for Other Control Variables:						
Gender (Female)						
Male		0.029	0.013		-5.61***	-3.94***
		(0.026)	(0.024)		(1.36)	(1.20)
Age (18)						
Below 18		-0.044	-0.038		-0.82	-0.31
		(0.038)	(0.035)		(2.24)	(1.97)
19-22		-0.024	-0.016		1.69	1.98
		(0.029)	(0.028)		(1.59)	(1.45)
23 and above		-0.074***	-0.038		10.98***	8.91***
		(0.029)	(0.033)		(1.52)	(1.59)
Credential (Advanced Diploma)						
Certificate		0.107	0.073		-2.38	0.22
		(0.070)	(0.056)		(3.38)	(2.89)
Diploma		0.007	0.012		0.90	0.52
		(0.029)	(0.031)		(1.65)	(1.46)
School (Business)						
Comm. and Justice Studies		-0.044	-0.051		1.64	2.90*
		(0.044)	(0.041)		(1.84)	(1.70)
Health Sciences		-0.083	-0.081		3.74*	1.53

	Leaving Rate			First Term GPA		
	(1) No control variables	(2) Student background (excluding high school avg)[2]	(3) All control variables[3]	(1) No control variables	(2) Student background (excluding high school avg)	(3) All control variables
		(0.054)	(0.051)		(2.23)	(2.19)
Interdisciplinary Studies		-0.054	-0.056		-3.32	-2.89
		(0.056)	(0.048)		(3.90)	(3.31)
Media and Entertainment		-0.037	-0.036		-1.19	-0.78
		(0.049)	(0.046)		(2.47)	(2.16)
Skilled Trades		-0.023	-0.018		4.05	4.25*
		(0.055)	(0.053)		(2.70)	(2.48)
Technology		-0.034	-0.003		2.55	0.53
		(0.049)	(0.051)		(2.20)	(1.97)
High School Average, 3-4 years (A minus)						
B and below			0.134***			-11.65***
			(0.050)			(2.58)
B plus			0.040			-5.75***
			(0.039)			(1.99)
A			-0.015			3.51**
			(0.032)			(1.51)
A plus			-0.006			8.74***
			(0.043)			(1.59)
Missing			-0.081***			5.62***
			(0.028)			(1.90)
Reading-Assessment Score Category (Bottom Third)						
Middle Third			-0.014			2.40

	Leaving Rate			First Term GPA		
	(1) No control variables	(2) Student background (excluding high school avg)[2]	(3) All control variables[3]	(1) No control variables	(2) Student background (excluding high school avg)	(3) All control variables
			(0.026)			(1.47)
Top Third			-0.048*			5.49***
			(0.027)			(1.53)
Missing			0.757***			-8.54***
			(0.020)			(3.23)
Writing-Assessment Score Category (Below Median)						
Above Median			-0.033			3.98***
			(0.024)			(1.21)
Missing			-0.229***			11.61***
			(0.013)			(3.10)
Panel C: Predicted Probabilities of Leaving for Treatment and Control Groups						
Control Group	0.148	0.122	0.125	71.28	71.53	71.49
Treatment Group	0.105	0.089	0.087	73.12	72.88	72.92
Difference	-0.043	-0.033	-0.038	1.84	1.35	1.43
Relative Difference (%)	-29	-26.8	-31	2.58	1.89	2
Observations	775	745	745	729	729	729

[1] Standard errors are in parentheses. Credential categories Degree and Graduate Certificate are dropped from the regressions due to multicollinearity. Engineering Technology Preparatory is also dropped from the regressions since there are only 3 students in this school. Notations: * p<0.10 ** p<0.05 *** p<0.01.

[2] Column (2) adds age, credential, and school variables.

[3] Column (3) adds high school average, writing and reading assessment variables to column (2).

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